

### **REMARKS**

Favorable reconsideration of this application is requested in view of the following remarks.

Claim 11 has been amended to exclude  $D_2O_2$  from the deuterated solvent to coincide with the method of claim 1 as supported by examples 16-23 on pages 29-30 of the specification. Claim 16 has been added as supported by the specification at page 2, lines 9-16, page 10, line 12 – page 11, line 1, and page 11, lines 27-31. No new matter has been included. Claim 17 has been added as supported by the specification at page 2, lines 9-16 and page 11, lines 27-31.

Claims 1-3, 5-10, and 13 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Dingwen et al. (Japanese Patent Application Publication No. 45-17402) in view of Kato et al. (U.S. Patent No. 4,874,890). Applicants respectfully traverse this rejection.

With respect to the heavy hydrogen sources, claim 1 of the present application recites a deuterated solvent other than  $D_2O_2$ . Dingwen discloses use of  $D_2O_2$  as a heavy hydrogen source in addition to  $D_2O$  and further discloses that  $D_2O_2$  is used as a promoter of the deuteration reaction, i.e., a reaction catalyst, in order to replace hydrogen atoms in a compound with deuterium atoms completely (see paras. 3-6 on page 1 under “Detailed explanation of invention” and tables 1-3 on pages 3-5, respectively, in the translation). For example, the method of Dingwen is used to obtain deuterated compounds having 99 % or higher isotope purity (see para. 6 under “Detailed explanation of invention”). Thus, in the deuteration reaction of Dingwen,  $D_2O_2$  is an essential element to obtain the highly deuterated compounds, and Dingwen clearly teaches that without using  $D_2O_2$ , such high deuteration ratio could not be expected (see paras. 3-6 on page 1 under “Detailed explanation of invention” and tables 1-3 on pages 3-5, respectively). When  $D_2O_2$  is used as a heavy hydrogen source, a substrate compound that may be decomposed with  $D_2O_2$  cannot be deuterated by the method (see page 2, lines 9-16 of the specification). However, if  $D_2O_2$  is eliminated from the reaction system, the deuteration ratios would be

low (see paras. 3-6 on page 1 under “Detailed explanation of invention” and tables 1-3 on pages 3-5, respectively). Achieving the high deuteration ratio without using  $D_2O_2$  is a challenge that the method of claim 1 resolves (see page 2, lines 9-16 and tables 1-3 on pages 29-31, respectively, of the specification), and Dingwen teaches away from claim 1 of the present invention.

Kato discloses  $D_2O$  or alternatively, a combination of  $D_2O$  and  $D_2$  gas as a heavy hydrogen source for deuterating methyl acrylate or methacrylate (see abstract coln. 2, lines 5-9). Kato does not disclose particular examples of using the combination or difference of deuteration ratios or preference between a method using  $D_2O$  and that using the combination of  $D_2O$  and  $D_2$  gas. If  $D_2O$  alone is used for deuteration, the deuteration ratios in Kato are 58 %, 42 %, 41 %, 45 %, 30 %, and 15 % (see examples 1-6, respectively, in colns. 3-4 and table 1 in coln. 4), which are much lower than Dingwen’s deuteration ratio of 99 % or higher (see para. 6 under “Detailed explanation of invention”). Accordingly, in order to obtain a high deuteration ratio without using  $D_2O_2$  as a heavy hydrogen source, there is no reasonable basis to combine Dingwen with Kato and replace the heavy hydrogen source of  $D_2O_2$ , which is an essential element for Dingwen to obtain the high deuteration ratio, with  $D_2O$  or a combination of  $D_2O$  and  $D_2$  gas, which would be expected to provide much lower deuteration ratios than  $D_2O_2$  such as 58 % or lower as discussed above (see examples 1-6 in colns. 3-4 and table 1 in coln. 4). In contrast, by using the method of claim 1, sodium methacrylate and methacrylic acid, which would be similar to the substrate compounds of Kato, can be deuterated at a nearly 99 % ratio (see table 3 on page 31 of the specification). Accordingly, claim 1 and claims 2-3, 5-9, and 13, which ultimately depend from claim 1, are distinguished from Dingwen in view of Kato, and this rejection should be withdrawn.

Previously presented claim 14 and new claims 16 and 17, which depend from claim 1, are distinguished from Dingwen in view of Kato for at least the same reasons as discussed for claim 1 above.

In addition, claim 16 recites that the heavy hydrogen sources do not include  $D_2$  in addition to  $D_2O_2$ , and further recites that an alkali metal deuterioxide is not included, which ensures the neutral condition recited in claim 1. In the reaction system of Dingwen, NaOD is a necessary element to obtain the high deuteration ratio (see paras. 3-

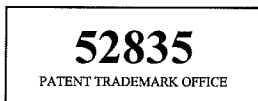
6 on page 1 of the translation). In addition to the high deuteration ratio achieved by the method of claim 16 as discussed for claim 1 above, by excluding the alkali metal deuterioxide, which is a strong base, from the reaction system of claim 16, the deuterated compound can be isolated without taking cumbersome purification steps (see page 2, lines 9-16 of the specification). Accordingly, claim 16 is further distinguished from Dingwen also in this respect.

Claim 17 recites that the substrate compound is a compound decomposable with  $D_2O_2$  and/or a compound that has at least one double bond or one triple bond. The method of Dingwen is not applicable to the substrate compounds that are decomposable with  $D_2O_2$  since for the method of Dingwen,  $D_2O_2$  is an essential element. Further,  $D_2$  gas is included in one of the heavy hydrogen source options in Kato (see coln. 2, lines 5-9). It is known that  $D_2$  gas may reduce a double bond or a triple bond in the compound (see page 2, lines 30-33 of the specification). Thus, the option of the heavy hydrogen source of  $D_2O$  and  $D_2$  gas in Kato cannot be used for the unsaturated substrate compounds recited in claim 17. With the heavy hydrogen source of  $D_2O$  alone, Kato, however, clearly exhibits low deuteration ratios (see examples 1-6, respectively, in colns. 3-4 and table 1 in coln. 4). The advantages of claim 17 such that the method is applicable to the substrate compounds that may be decomposed with  $D_2O_2$  or reduced with  $D_2$  gas while achieving the high deuteration ratio are unexpected from the combination of Dingwen and Kato, and claim 17 is further distinguished from Dingwen in view of Kato.

Claim 10 has been canceled without prejudice.

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In view of the above, Applicants request reconsideration of the application in the form of a Notice of Allowance.



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